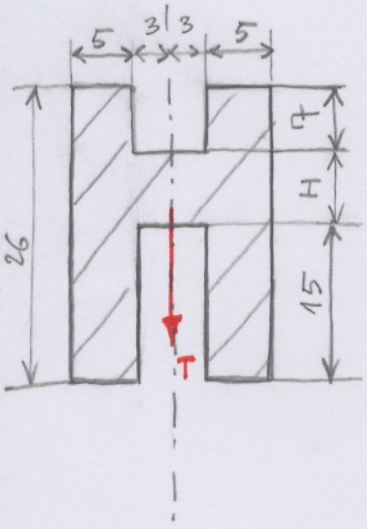
SFORZI DI TAGLIO

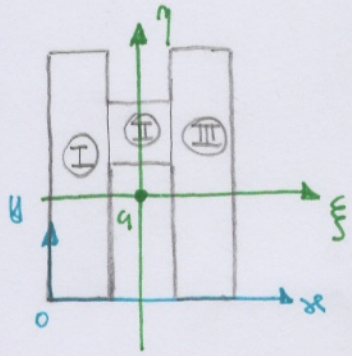


T = 6 kN Calcolo τ_{MAX}

$H = 26 - 15 - 7 = 4$

CALCOLO BARICENTRO

SIST. $\{O\ \xi\eta\}$



- y_G

$S_{x_I} = A_I\, y_{G_I} = (5 \cdot 26) \cdot 13 = 1690\ mm^3$

$S_{x_{II}} = A_{II}\, y_{G_{II}} = (6 \cdot 4) \cdot 17 = 408\ mm^3$

$S_{x_{III}} = A_{III}\, y_{G_{III}} = (5 \cdot 26) \cdot 13 = 1690\ mm^3$

$S_x = S_{x_{II}} + S_{x_I} \cdot 2 = 3788\ mm^3$

$S_x = A_{TOT} \cdot y_G \rightarrow y_G = \dfrac{S_x}{A_{TOT}} = \dfrac{3788}{2(5 \cdot 26) + 6 \cdot 4} = 13.3380\ mm$

- x_G

$S_{y_I} = A_I \cdot x_{G_I} = (5 \cdot 26) \cdot 2.5 = 325\ mm^3$

$S_{y_{II}} = A_{II} \cdot x_{G_{II}} = (6 \cdot 4) \cdot 8 = 192\ mm^3$

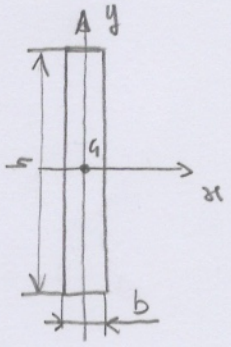
$S_{y_{III}} = A_{III} \cdot x_{G_{III}} = (5 \cdot 26) \cdot 13.5 = 1755\ mm^3$

$S_y = S_{y_I} + S_{y_{II}} + S_{y_{III}} = 2272\ mm^3$

$x_G = \dfrac{S_y}{A_{TOT}} = \dfrac{2272}{2 \cdot 5 \cdot 26 + 6 \cdot 4} = 8\ mm$ OK

MOMENTI DI INERZIA $\{G\ \xi\ \eta\}$

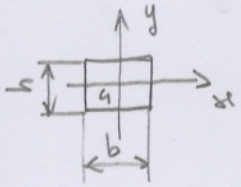
- RETT. I e III



$$I_{x_I} = \frac{bh^3}{12} = \frac{5 \cdot 26^3}{12} = 4323.3333\ mm^4$$

$$I_{y_I} = \frac{hb^3}{12} = \frac{26 \cdot 5^3}{12} = 270.8333\ mm^4$$

- RETT. II



$$I_{x_{II}} = \frac{bh^3}{12} = \frac{6 \cdot 4^3}{12} = 32\ mm^4$$

$$I_{y_{II}} = \frac{hb^3}{12} = \frac{4 \cdot 6^3}{12} = 72\ mm^4$$

MOMENTI DI INERZIA SIST. CENTRALE $\{G\ \xi\ \eta\}$

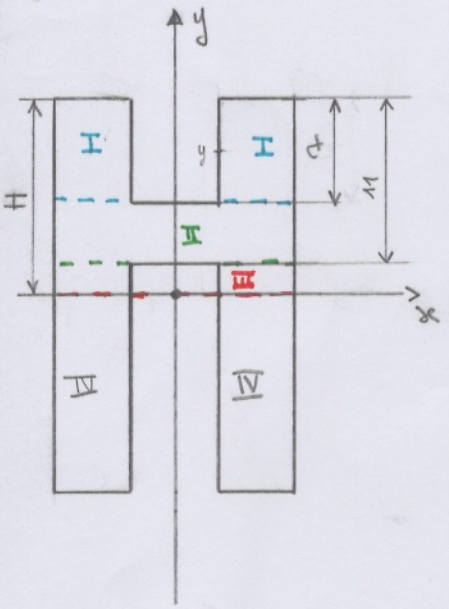
$$I_\xi = 2\underbrace{\left[I_{x_I} + A_I (y_G - 13)^2\right]}_{I_{x_{I,III}}} + \underbrace{I_{x_{II}} + A_{II} (17 - y_G)^2}_{I_{x_{II}}} =$$

$$= 2\left[7323.333 + (5 \cdot 26)(0.3380)^2\right] + 32 + (6 \cdot 4)(3.6620)^2 = 15030.2160\ mm^4$$

$$I_\eta = I_{y_I} + A_I (x_G - 2.5)^2 + I_{y_{II}} + A_{II} \underbrace{(x_G - x_G)}_{\emptyset}^2 + I_{y_{III}} + A_{III} (13.5 - x_G)^2 =$$

$$= 270.8333 + (5 \cdot 26) \underbrace{(8 - 2.5)^2}_{5.5^2} + 72 + 270.8333 + (5 \cdot 26) \underbrace{(13.5 - 8)^2}_{5.5^2} =$$

$$= 2\left[270.8333 + (5 \cdot 26) \cdot 5.5^2\right] + 72 = 8478.6667\ mm^4$$



CALCOLO τ JOURAWSKY $\tau = \dfrac{T \cdot S_x^*(y)}{I_x \cdot b(y)}$ (3)

$H = 26 - y_G = 26 - 13.3380 = 12.6620$ mm

(I) $\overbrace{5.662}^{H-7} < y < \overbrace{12.6620}^{H}$

$$S_{x_I}(y) = 2\cdot(H-y)\cdot 5\left(y + \frac{(H-y)}{2}\right) = 10(H-y)\left(\frac{2y+H-y}{2}\right) =$$

$$= 10(H-y)\left(\frac{H+y}{2}\right) = 5\left(H^2 - y^2\right)$$

$$\tau_I(y) = \frac{6000 \cdot 5\left(H^2 - y^2\right)}{10 \cdot I_x} = \begin{cases} \tau(H) = \emptyset \\ \tau(H-7) = 25.6013 \text{ MPa} \end{cases}$$

(II) $(H-11) < y < (H-7)$

$$S_{x_{(I+II)}}(y) = \left(2\cdot 5\cdot 7\cdot(H-3.5)\right) + 16\cdot\left(H-7-y\right)\left(y + \frac{(H-7-y)}{2}\right) =$$

$$= 641.3380 + 16\left(5.6620 - y\right)\left(\frac{2y + H - 7 - y}{2}\right) =$$

$$= 641.3380 + 16\left(5.6620 - y\right)\left(\frac{5.6620 + y}{2}\right) =$$

$$= 641.3380 + 8\left(5.6620^2 - y^2\right)$$

$$\tau_{II+I}(y) = \frac{6000\left[641.3380 + 8\left(5.6620^2 - y^2\right)\right]}{16 \cdot I_x} = \begin{cases} \tau(H-7) = 16.0012 \text{ MPa} \\ \tau(H-11) = 21.8486 \text{ MPa} \end{cases}$$

(III)

$0 < y < H-11$

$$S_{x_{III+II+I}}(y) = 2\cdot 5\cdot 7\,(H-3.5) + 16\cdot(11-7)\left(H-11+\frac{(11-7)}{2}\right) + 2\cdot 5\cdot(H-11-y)\left(y + \frac{H-11-y}{2}\right) =$$

$$= 875.7042 + 5\cdot\left((H-11)^2 - y^2\right)$$

$$\tau_{III} = \frac{6000\cdot\left[875.7042 + 5\left((H-11)^2 - y^2\right)\right]}{10\cdot I_x} = \begin{cases} \tau(H-11) = 34.9578 \text{ MPa} \\ \tau(0) = 35.5091 \text{ MPa} \end{cases}$$

$-y_4 < y < \emptyset$

$$S_{\text{IV}}(y) = 2\cdot\left(\frac{5\cdot H^2}{2}\right) + (4\cdot 6)(H-11+2) + 2(5-y)\left(\frac{y}{2}\right) =$$

$$= 888.5150 - 5y^2$$

$$\tau_{\text{IV}}(y) = \frac{6000\left[888.5150 - 5y^2\right]}{10\cdot I_x} = \begin{cases} \tau(0) = 35.5081 \\ \tau(-y_4) = \emptyset \end{cases}$$